

GERMAN



PATENT OFFICE

⑫ **Utility Model**

**U1**

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- (73) Name and residence of the owner  
Kernforschungszentrum Karlsruhe GmbH, 76133  
Karlsruhe, DE

TRANSLATION

## **Implant**

The invention concerns and implant according to claim 1.

An implant for spinal column correction is known in DE 38 41 008 A1. The implant possesses bone screws and a compression or distraction rod that is connected to a screw head of the bone screw. The rod extends between two neighboring bone screws, and the ends of the contraction or distraction rod are connected to the screw heads in a manner that enables the rod alignment to be adjustable relative to the axis of the screw shaft. A device is provided at the screw head to lock the compression or distraction rod in the set rod alignment. A preferred embodiment is characterized in that the screw head has a ring collar and a pressure ring that is coaxial with the screw shaft and can be clamped against each other with a pin coaxial with screw shaft. In this case, the compression or distraction rod has an annular shell forming the rod end by means of which it can be placed on the pin between the ring collar and the pressure ring and clamped between them. The annular shell has a slot that receives the pin with a long axis running in the direction of the rod axis. The annular surfaces of the ring collar, annular shell and pressure ring assigned to each other are designed as corresponding parts of the spherical surfaces centered on the axis of the screw shaft.

This implant provides spinal column correction and does not allow any restricted movement of the vertebral bodies in relation to each other after implantation. Implantation is complicated due to the numerous individual parts.

The innovation is based on the task of presenting an implant that allows the surgeon the option of using either a completely rigid or slightly mobile implant with essentially the same parts.

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This task is accomplished according to the invention by the implant described in the first claim. Additional claims describe advantageous embodiments of the implant.

The implant described in claim 1 essentially consists of three different components: at least two bone screws, at least one connecting rod and one element that fixes the connecting rod to the bone screw.

The construction of individual components and the effect of the implant will be explained in the following with reference to the figure.

The bone screws 1 have a screw head with a cylindrical recess 2. The axis of symmetry of the recess 2 is parallel to the screw axis and advantageously coincides with the screw axis. There is also at least one slot 8 in the edge of the screw head so that the cylindrical recess 2 is interrupted at the slot 8. If only one slot 8 is provided, the implant consists of two screws 1 and a single connecting rod 3. If two slots 8 are provided, the implant can consist of a number  $n$  ( $n \geq 2$ ) of screws 1 and  $(n - 1)$  connecting rods 3.

The connecting rods 3 are designed identically; they have a middle part whose thickness is dimensioned so that it can be inserted in the slot 8 of the bone screws 1, and the rods have two thick sections at their ends. One of the thick sections 6 consists of a sphere. The other thick section 4 has a ring-like cross-section; the ring is interrupted at the side 5 facing the middle part with a width that at least corresponds to the thickness of the middle part. In addition, the ring shape is such that the thick section 4 can be inserted in the recess 2 of the screw head, and it can also receive the other thick section 6 of another connecting rod so that thick section 6 is enclosed by the ring. The ring-shaped thick section 4 is preferably designed so that both its inside and outside parts form a spherical surface.

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The middle part of the connecting rods can also be constructed so that it can extend and hence adapt to the anatomical situation. Extension is for example enabled by dividing the middle part, providing a thread to the areas neighboring the division, and enabling both threads to be screwed into the threaded sleeve connecting the parts. Alternately, one part can be provided with an outer thread and the other part can be provided with a fitting inner thread.

The thick sections 4, 6 of the connecting rods 3 are inserted in the recess 2 of the bone screws so that the annular thickening 4 surrounds the spherical thickening 6. The middle parts of the connecting rods 3 extend through the interruption 5 of the annular shape and through the slots 2 in the head of the bone screws 1 if more than two bone screws are used. If only one bone screw is used, the annular-shaped thick section 4 does not receive an additional connecting rod 3.

The thick sections 4, 6 are fixed in the recess 2 in the head of the bone screw 1 by an element 7. In the simplest case, the element is a collar that is screwed onto the externally-threaded edge of the screw head.

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There can be two embodiments of the element 7. One embodiment serves to tightly fix the connecting rods in a predetermined position. If a collar is provided as the element, its inner part can be shaped so that a large amount of its surface contacts the thick sections 4, 6 and hence fixes them.

Frequently, however, a less rigid connection of the vertebral bodies is desired when the implant is inserted, and the vertebral bodies can move to a certain extent in relation to each other. Only large movements are prevented by the implant. In this case, such an element 7 is used that only holds the thick sections 4, 6 in the recess 2 of the bone screw 1 and allows the vertebral bodies to move in relation to each other as determined by the width of the slot 8 or interruptions 5 and the thickness of the middle part. If a union nut is used as the element 7 in this case, the union nut does not contact either of two thick sections 4, 6 after it is screwed onto the head of the bone screw.

DANKUATION

**Claims:**

1. Implant to affix vertebral bodies with:
  - a) at least two bone screws (1) with a cylindrical recess (2) in their heads such that their axis runs parallel to the screw axis, and the recess (2) has at least one slot (8) parallel to the screw axis,
  - b) at least one connecting rod (3) by means of which the bone screws (1) can be bridged, and the rod's thickness is less than the width of the slot (8), whereby the connecting rod (3)
    - has a thick section (4) with an annular cross-section on one end with a continuous slot (5) symmetrical to the axis of the connecting rod (3), and
    - has a spherical thick section (6) on its other end, and
  - c) the shape of the thick section (4) with the annular cross-section is such that it can be inserted in the cylindrical recess (2) in the head of one of the bone screws (1), and the spherical thick section (6) of another connecting rod (3) can be inserted in the thick section (4) with an annular cross-section,
  - d) an element (7) to fix the thick sections (4) and (6) in the recesses (2).
2. Implant according to claim 1 with a union nut (7) as an element to fix the thick sections (4, 6).

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3. Implant according to claim 1 or 2 with at least one connection rod (3), whose inner surface of the thick section (4) with an annular cross-section forms a part of a spherical surface.
4. Implant according to claim 1, 2 or 3 with at least one connecting rod (3) whose outer surface of the thick section (4) with an annular cross-section forms a part of a spherical surface.
5. Implant according to one of claims 1 to 4, whereby the length of the connecting rod (3) can be set.
6. Implant according to one of claims 1 to 5 with an element 7 that blocks the thick sections 4, 6 in the recess 2.
7. Implant according to one of claims 1 to 5 with an element 7 that does not block the thick sections 4, 6 in the recess 2.

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[GRAPHIC IMAGE]

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**info@corporatetranslations.com**

**1300 Aviation Blvd. Redondo Beach, California 90278-4011**  **310.376.1400**  **310.376.1394**